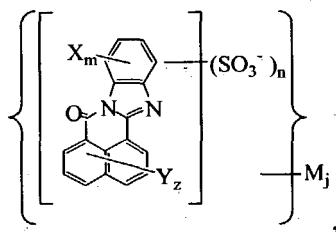


## CLAIMS

What is claimed is:

1. A 1,8-Naphthoylene-1',2'-benzimidazole sulfoderivative of the general structural formula



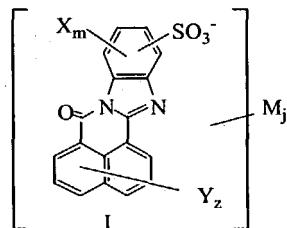
where  $n$  is an integer in the range of 1 to 4,  $m$  is an integer in the range from 0 to 4;  $z$  is an integer in the range of 0 to 6, and the values of  $m$ ,  $n$ , and  $z$  satisfy the equation  $m + z + n \leq 10$ ;

and  $X$  and  $Y$  are individually selected from the group consisting of  $CH_3$ ,  $C_2H_5$ ,   
10  $OCH_3$ ,  $OC_2H_5$ ,  $Cl$ ,  $Br$ ,  $OH$ , and  $NH_2$ ; and

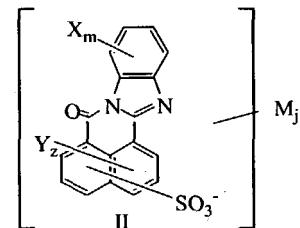
$M$  is a counterion, and  $j$  is the number of different counterions ( $M$ ) in a single molecule of said 1,8-Naphthoylene-1',2'-benzimidazole sulfoderivative.

2. The 1,8-Naphthoylene-1',2'-benzimidazole sulfoderivative of claim 1 wherein the structural formula is chosen from the group consisting of structures I-

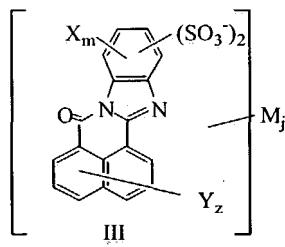
15 VIII:



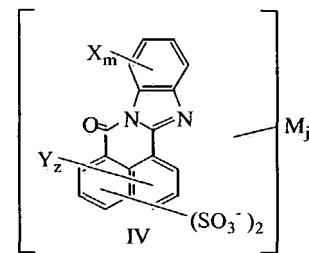
where  $m$  is an integer in the range of 0 to 3, and  $z$  is an integer in the range of 0 to 4



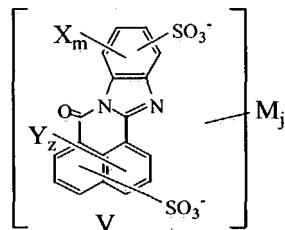
where  $m$  is an integer in the range of 0 to 4, and  $z$  is an integer in the range of 0 to 4



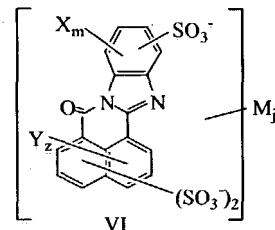
where  $m$  is an integer in the range of 0 to 2, and  $z$  is an integer in the range of 0 to 4



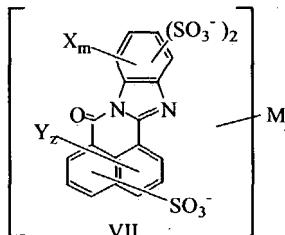
where  $m$  is an integer in the range of 0 to 4, and  $z$  is an integer in the range of 0 to 4



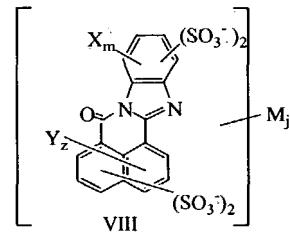
where  $m$  is an integer in the range of 0 to 3, and  $z$  is an integer in the range of 0 to 4



where  $m$  is an integer in the range of 0 to 3, and  $z$  is an integer in the range of 0 to 4



where  $m$  is an integer in the range of 0 to 2, and  $z$  is an integer in the range of 0 to 4



where  $m$  is an integer in the range of 0 to 2, and  $z$  is an integer in the range of 0 to 4

where  $X$  and  $Y$  are individually selected from the group consisting of  $\text{CH}_3$ ,  $\text{C}_2\text{H}_5$ ,  $\text{OCH}_3$ ,  $\text{OC}_2\text{H}_5$ ,  $\text{Cl}$ ,  $\text{Br}$ ,  $\text{OH}$ , or  $\text{NH}_2$ .

3. The 1,8-Naphthoylene-1',2'-benzimidazole sulfoderivative according to claims 1 or 2, wherein

5 said counterion ( $M$ ) is shared among several molecules; and said number of counterions ( $j$ ) is fractional.

4. The 1,8-Naphthoylene-1',2'-benzimidazole sulfoderivative according to claim 3, wherein

n > 1; and

M<sub>j</sub> is more than one counterion.

5. The 1,8-Naphthoylene-1',2'-benzimidazole sulfoderivative of claim 1 or 2 wherein said 1,8-Naphthoylene-1',2'-benzimidazole sulfoderivative forms a stable lyotropic liquid crystal system.

6. A lyotropic liquid crystal system containing at least one 1,8-naphthoylene-1',2'-benzimidazole sulfoderivative of any of claims 1 or 2.

7. The lyotropic liquid crystal system of claim 6 containing an individual 1,8-naphthoylene-1',2'-benzimidazole sulfoderivative.

10 8. The lyotropic liquid crystal system of claim 7 containing a mixture of said 1,8-naphthoylene-1',2'-benzimidazole sulfoderivatives.

9. The lyotropic liquid crystal system of claim 7, further comprising a mixture of water and an organic solvent that is miscible with water in any proportion.

15 10. The lyotropic liquid crystal system of claim 7, further comprising a mixture of water and an organic solvent that is characterized by limited miscibility with water.

11. The lyotropic liquid crystal system of claim 7 wherein the concentration of said 1,8-naphthoylene-1',2'-benzimidazole sulfoderivatives is in the range of approximately 3% to 40% by mass.

20 12. The lyotropic liquid crystal system of claim 7 wherein the concentration of 1,8-naphthoylene-1',2'-benzimidazole sulfoderivatives is in the range of approximately 7% to 15% by mass.

13. The lyotropic liquid crystal system of claim 7, further comprising up to approximately 5% by mass of surfactants.

14. The lyotropic liquid crystal system of claim 7, further comprising up to approximately 5% by mass of plasticizers.

15. The lyotropic liquid crystal system of claim 7, further comprising at least one other water-soluble organic dye.

5 16. The lyotropic liquid crystal system of claim 7, further comprising a second organic compound, said second organic compound being capable of participating in the formation of said liquid crystal phase with at least one of said at least one 1,8-naphthoylene-1',2'-benzimidazole sulfoderivatives.

10 17. The lyotropic liquid crystal system according to claim 8, comprising at least two compounds of at least one structure selected from structures I through VIII and having at least two different substituents.

15 18. A lyotropic liquid crystal system, containing a mixture of one or more 1,8-naphthoylene-1',2'-benzimidazole sulfoderivatives according to claim 2 wherein: the concentration of each individual 1,8-naphthoylene-1',2'-benzimidazole sulfoderivative in said mixture depends on one or more desired properties of said mixture and wherein said mixture comprises:  
one or more monosulfoderivatives of structures I and II with a concentration in the range of approximately 0% to 99% by mass;  
one or more disulfoderivatives of structures III and IV with a concentration in the range of approximately 0% to 99% by mass;  
one or more trisulfoderivatives of structures VI and VII with a concentration in the range of approximately 0% to 30% by mass; and  
one or more tetrasulfoderivatives of structure VIII with a concentration in the range of approximately 0% to 20% by mass.

20 19. The lyotropic liquid crystal system of claim 18, wherein said mixture comprises:

one or more monosulfoderivatives of structures I and II with a concentration in the range of approximately 50% to 99% by mass;

one or more disulfoderivatives of structures III and IV with a concentration in the range of approximately 50% to 99% by mass;

one or more trisulfoderivatives of structures VI and VII with a concentration in the range of approximately 10% to 20% by mass; and

5 one or more tetrasulfoderivatives of structure VIII with a concentration in the range of approximately 5% to 10% by mass.

20. An optically anisotropic film comprising an individual 1,8-naphthoylene-1',2'-benzimidazole sulfoderivative according to claims 1 or 2.

10 21. The optically anisotropic film of claim 20, comprising two or more 1,8-naphthoylene-1',2'-benzimidazole sulfoderivatives.

22. The optically anisotropic film of claim 20, comprising a mixture of the 1,8-naphthoylene-1',2'-benzimidazole sulfoderivatives.

23. The optically anisotropic film of claim 20, wherein said film further comprises at least one other organic compound.

15 24. An optically anisotropic film, wherein said film is formed by depositing a liquid crystal system according to claim 7 onto a substrate; applying an orienting force; and drying said film.

25. The optically anisotropic film of claim 24, wherein said film is at least 20 partially crystalline.

26. The optically anisotropic film of claim 20, comprising at least two compounds of at least one structure selected from structures I through VIII and having at least two different substituents.

27. The optically anisotropic film of claim 22, comprising at least two 25 compounds selected from the I to VIII group.

28. The optically anisotropic film of claim 21, wherein said film is a retarder film.

29. The optically anisotropic film of claim 21, wherein said film is polarizing.

5 30. A method of forming an optically anisotropic film, comprising the steps of

depositing a liquid crystal system according to claim 7 onto a substrate; applying an orienting force; and drying said film.